

Calculus Warm Up #11-5

Use product rule to find the first derivative, simplify it, then find the second derivative, simplify.

$$f(x) = \frac{3x}{\sqrt[3]{x^2 + 3}}$$

Calculus Warm Up #11-5

Use product rule to find the first derivative, simplify it, then find the second derivative, simplify.

$$f(x) = \frac{3x}{\sqrt[3]{x^2 + 3}} \rightarrow 3x(x^2 + 3)^{-1/3}$$

$$f'(x) = \frac{x^2 + 9}{(x^2 + 3)^{4/3}}$$

$$\begin{aligned} f'(x) &= 3x \left(\frac{-1}{3} \right) (x^2 + 3)^{-4/3} (2x) + 3(x^2 + 3)^{-1/3} \\ &= \frac{-2x^2}{(x^2 + 3)^{4/3}} + \frac{3}{(x^2 + 3)^{1/3}} \cdot \frac{(x^2 + 3)}{(x^2 + 3)} \\ &= \frac{x^2 + 9}{(x^2 + 3)^{4/3}} \cdot \\ &= (x^2 + 9)(x^2 + 3)^{-4/3} \end{aligned}$$

$$f''(x) = \frac{-2x^3 - 54x}{3(x^2 + 3)^{7/3}}$$

Staple up and turn in:

Warm up

Tan slope fields

AP Rev. # 7

Anything from #7 we should go over on Monday?

#15b, 16b, 13b, 11, 12, 14c

HW Questions: p. 467

In Exercises 39–58, find the derivative of the given function.

39. $f(x) = \arcsin 2x$

41. $f(x) = 2 \arcsin (x - 1)$

43. $f(x) = 3 \arccos \frac{x}{2}$

45. $f(x) = \arctan 5x$

47. $f(x) = \arccos \frac{1}{x}$

$$u = \frac{x}{2} \quad u' = \frac{1}{2}$$

$$f'(x) = \left(-\frac{1}{2}\right) 3 \cdot \frac{1}{\sqrt{1 - \frac{x^2}{4}}}$$

$$= \frac{-3}{2\sqrt{4 - x^2}}$$

$$=$$

In Exercises 39–58, find the derivative of the given function.

39. $f(x) = \arcsin 2x$

41. $f(x) = 2 \arcsin (x - 1)$

43. $f(x) = 3 \arccos \frac{x}{2}$

45. $f(x) = \arctan 5x$

47. $f(x) = \arccos \frac{1}{x}$

$$u = \frac{1}{x}$$

$$u' = -\frac{1}{x^2}$$

$$\begin{aligned} 47) f'(x) &= \frac{\frac{1}{x^2}}{\sqrt{\frac{x^2}{x^2} - \frac{1}{x^2}}} \\ &= \frac{\frac{1}{x^2}}{\frac{\sqrt{x^2 - 1}}{\sqrt{x^2}}} \\ &= \frac{\frac{1}{x^2}}{\frac{\sqrt{x^2 - 1}}{|x|}} \\ &= \frac{1}{x^2} \cdot \frac{|x|}{\sqrt{x^2 - 1}} \end{aligned}$$

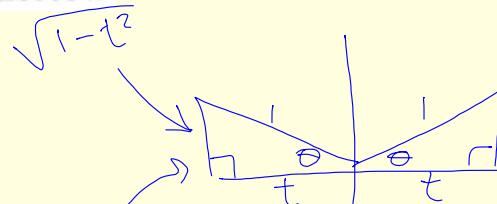
$$\arccos \frac{1}{x} = \frac{1}{|x| \sqrt{x^2 - 1}}$$

$$\sqrt{x^2} = |x|$$

49. $f(x) = \arcsin x + \arccos x$

51. $h(t) = \sin(\arccos t)$

53. $f(t) = \frac{1}{\sqrt{6}} \arctan\left(\frac{\sqrt{6}t}{2}\right)$



$$\rightarrow h(t) = \sqrt{1-t^2}$$

$$\rightarrow u = \frac{\sqrt{6}t}{2}$$

$$\frac{1}{2} \cdot \text{---}$$

$$\frac{du}{dx} = \frac{\sqrt{6}}{2}$$

$$\frac{d}{dx} [\arctan u] = \text{---}$$

$$55. f(x) = \frac{1}{2} \left(\frac{1}{2} \ln \frac{x+1}{x-1} + \arctan x \right)$$

$$f(x) = \frac{1}{4} \left[\ln(x+1) - \ln(x-1) + 2 \arctan x \right]$$

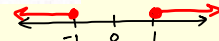
$$\begin{aligned} f'(x) &= \frac{1}{4} \left(\frac{1}{x+1} - \frac{1}{x-1} + \frac{2}{1+x^2} \right) \\ &= \frac{1}{4} \left(\frac{x-1-(x+1)}{x^2-1} + \frac{2}{1+x^2} \right) \\ &= \frac{1}{4} \left(\frac{-2}{x^2-1} + \frac{2}{1+x^2} \right) \end{aligned}$$

$$57. f(x) = x \arcsin x + \sqrt{1-x^2}$$

In Exercises 59 and 60, find the point of inflection of the graph of the given function.

$$59. f(x) = \arcsin x$$

In Exercises 61 and 62, find any relative extrema of the given function.

61. $f(x) = \arcsin x - x$ → domain is $|x| \leq 1$
 restricted → 
 $f'(x) = \frac{1}{\sqrt{1-x^2}} - 1$ undefined @ $x = 0, \pm 1$

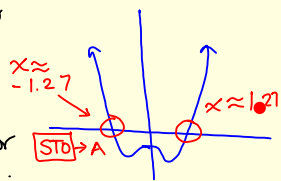
$$0 = \frac{1}{\sqrt{1-x^2}} - 1$$

$$1 = \frac{1}{\sqrt{1-x^2}} \quad \text{cross multiply}$$

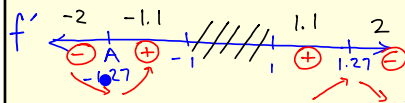
$$(\sqrt{1-x^2})^2 = (1)^2$$

$$x^2(1-x^2) = 1$$

$$x^4 - x^2 - 1 = 0$$

← doesn't factor so graph it. 

critical #'s: $\pm A (\approx \pm 1.27)$, ± 1 (0 is outside our domain)



$$f(A) = \arcsin\left(\frac{1}{A}\right) - A$$

$$\approx 3.75$$

Relative Min @ $\approx (-1.27, 3.75)$

$$f'(\pm 2) = \frac{1}{\sqrt{1-4}} - 1$$

$$= \frac{1}{2\sqrt{3}} - 1 \approx -0.7$$

$$f(-A) \approx -0.606$$

$$f'(\pm 1.1) \approx 0.98$$

Relative Max @ $\approx (1.27, -0.606)$

Group Ch. 8 Review

Work together like a group quiz.

It will be scored as classwork.

HW: p. 487, ch. 8 review

1 - 29 odd

Quiz Tuesday: 8.3, 8.5
with EC from previous material.